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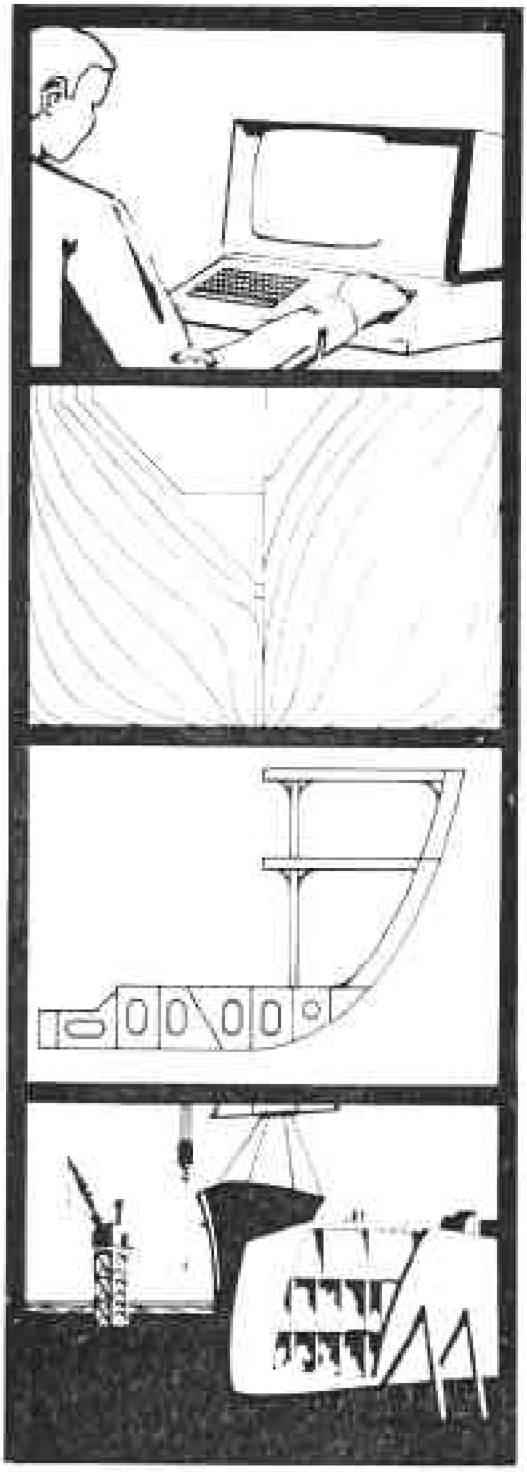

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SHIPBUILDING STEEL - UNITED STATES VS. JAPANESE PHILOSOPHIES

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INTRODUCTION:

The United States, with the steady decline in commercial and naval shipbuilding, is not able to command the respect of the steel producer of this country that is afforded the Japanese shipbuilding industry by its steel producers. This is shown by a lack of shipbuilding structural shapes with the Japanese able to use a wide array of structurals while the U.S. is restricted to using split wide flanges and angle; the largest shapes being, 9" x 4" rolled by mills only once a year.' Even the bulb plate; a standby of the industry, is no longer produced in the U.S.

This alone contributes to the greater cost of building ships in the U.S. without the help of political apathy, declining productivity, and a lack of modernized shipbuilding facilities.

I have often heard that in the United States there is more steel produced each year for drink cans than for building ships. This, of course, is somewhat of an exaggeration as the U.S. steel industry is a leader in the world production of steel. Unfortunately, too little of this steel is produced for the U.S. shipbuilding industry and according to the "Marine Engineering Log", June issue, in an article by Gene Heil, the overall prospects are hazy with much uncertainty in the government sector concerning our military and commercial shipbuilding industry. Although our shipbuilding industry is in a decline in some sectors with about 2.6-million gross tons, so is the rest of' the worlds, with Japan still in the lead with 6.2-million gross tons on the order book. This brings us to the subject at hand, "SHIPBUILDING STEEL U.S. VS. JAPANESE PHILOSOPHIES".

First let us examine the facts of steel production and its relationship to the shipbuilding industry in each country. Consider a year like 1978 (not the best for overall shipbuilding); lets compare the production of steel of each country and the percentage of the overall steel production used in the commercial shipbuilding industry. (See Fig. #1). The total amount of steel produced in the U.S. and Japan was over 100-million short tons through-put by each of the countries steel mills. (From "Iron Age" magazine, I.H.I. Data Book and "World Book Encyclopedia'). Japan completed about 6,3-million gross tons of ships (over 100 gross tons) to the United States 1.03-million gross tons. This small percentage leaves the U.S. shipbuilding industry very little influence over steel producers in the U.S. This is not to say that the steel industry isn't happy with our business, however, it is unfortunate that the U.S. shipbuilding industry is not strong enough to command the respect which is offered to our Japanese counterparts.

To illustrate some items that the shipbuilding industry of Japan has which are unavailable in the U.S., we need to consider the structural shapes produced by each country that lend themselves to shipbuilding. (See Fig. #2). First are the angles with the U.S. peaking out at an 8" x 4" with a rare 9" x 4" at the top. The Japanese mills offer a wide variety of angle type shapes up to 15" or 16" in depth and with varying thickness between the web and flange. These shapes remind me of the channels which were modified by cutting off a flange that is so often used in the barge building industry.

Consider the problem of ship bottom construction of a parallel midbody area. In order to be economy minded it is best to use the widest spaced longitudinals and the widest plates possible in order to reduce fitting and welding. In the

U.S. you are limited by a 9' high heavy angle, a modified wide flange shape, a fabricated structural member or import an appropriate shape if policy (Jones Act 1920) permits such; For example, the "FUTURE 32" ship of I.H.I. design, under construction at Levingston shipbuilding, in Orange, Texas, was originally designed with bottom and interbottom structurals of metric angles 250 x 90 x l0/15 (10 x 3 l/2 x 3/8 / 9/16). Structurals as these are ideal as they offer relative light weight (22.6 #/Ft.) for the section modulas produced (32.95 in^3).

The replacement was a tee section of 9 x 20#-which was lighter but created additional fitting and welding as illustrated in Fig. #3, The construction arrangement using tees is expensive using about 3500 feet of weld just in the innerbottom over what was required in an exact shipbuilt in Japan. Even the old bulb plate cannot be found in the U.S., so the substitute was heavy slabs with round bar welded to the edge for the main deck construction. Of course, other alternatives are available such as built up members and flanged plates as shown in Fig. #4. Most of the alternatives are expensive for they involve additional man-hours not required with better structural sections.

Recently (late July, 1979), I had the privilege of visiting a shipyard in Aioi, Japan, of the I.H.I. complex. I.H.I. Aioi Shipyard is impressive with good equipment that is hard pressed to be equaled in the U.S. and is somewhat typical to other Japanese shipyards except for the exception of having plenty of work. I expected to see rows and rows of purchased steel in their stock yard since they can build a 40,000 DWT tanker from fabrication start to delivery in eight (8) months -- (shades of U.S. World War II shipbuilding production). Was I ever wrong, for they maintain only two or three day steel stock and they receive steel every other day. The I.H.I. complex does not own a steel.mill as some Japanese shipyards do. These plates are <u>bought and delivered to the exact size needed</u> at the exact time needed for fabrication start.

Steel plates produced for the Japanese shipbuilding industry are rolled to the exact size needed. The scrap is held to a minimum of five mm (3/16") at each edge (from J.I.S. handbook interpretation by I.H.I.'s H. Kurose). Often for shell plating the exact size is requested and delivered. This is what the I.H.I. shipyard complex calls sketch sizes and are purchased and received exactly as the sketches call for. Plates bought under this system can often be used, depending upon thickness, without any additional preparation for welding and fitting. Contrasted to the steel plates bought from U.S. mills with stocked 2" in width and 3" in length for the purpose of squaring up. (See Fig. #5).

Another service the Japanese mills provided was to ship structurals which were blasted and pre-primed. This service is provided by all of the three or so steel mills the I.H.I. Aioi Shipyard use for their purchases. These shipments are all by water in small self-propelled ships which are tailored for this purpose. The steel is off-loaded and according to markings provided by the steel mill is sent directly into the fabrication area where it is needed whether directly to the photo electro marking process, numerical control burning machines, or to the many fabrication areas.

Many yards in the U.S. buy steel for the whole job or jobs when possible which is due to many reasons such as mill rolling schedules, price fluctuation and lead times. Many U.S. shipyards have very good material handling systems such as the N/C directed system in use at Avondale but they have to maintain a considerable amount of steel stocks. Some U.S. shipyards like the Japanese yards contract with the steel mills for so much tonnage per year. But, during the last U.S. steel shortage it was the shipyards who often suffered and not the appliance, automotive, farm equipment and construction equipment industries.

The philosophies of shipbuilding steel are not confined only to the ability to purchase steel but also to the processing of steel. In the U.S. many shipyards are still utilizing a system of transverse framing when getting into the shaped portion of a ship in the bow and stern. At least most utilize a system of transverse bilge framing and electing to bend only in one plane finding twisting longitudinal framing often too difficult. The I.H.I. Aioi Shipyard as well as most Japanese shipyards use a longitudinal framing system extending into bilges and to the bow and stern. This involves an uncomplicated system of using an inverse curve frame bending program and twisting the longitudinal members with direct heating which fixes the correct shape into each member. This system is much less costly than using the transverse framing system with all of its end connections and shaping required. Also, using the pre-shaped longitudinals lends itself to the next amazing usage of steel which was observed at the I.H.I. Aioi Shipyard. Steel plates are cut by the N/C burning machine after marking and shaped by a process called flame bending and shaping. Of course, some mechanical bending by hydraulic press and rolls is utilized just the same as with the U.S. shipyards. The more complicated shapes, like as used in bulbous bows, and bulb type sterns are put into plates by a process of heating and water quenching which can move plates into the correct shape desired. This method of construction is much less costly than other methods and often the use of an expensive casting can be avoided.

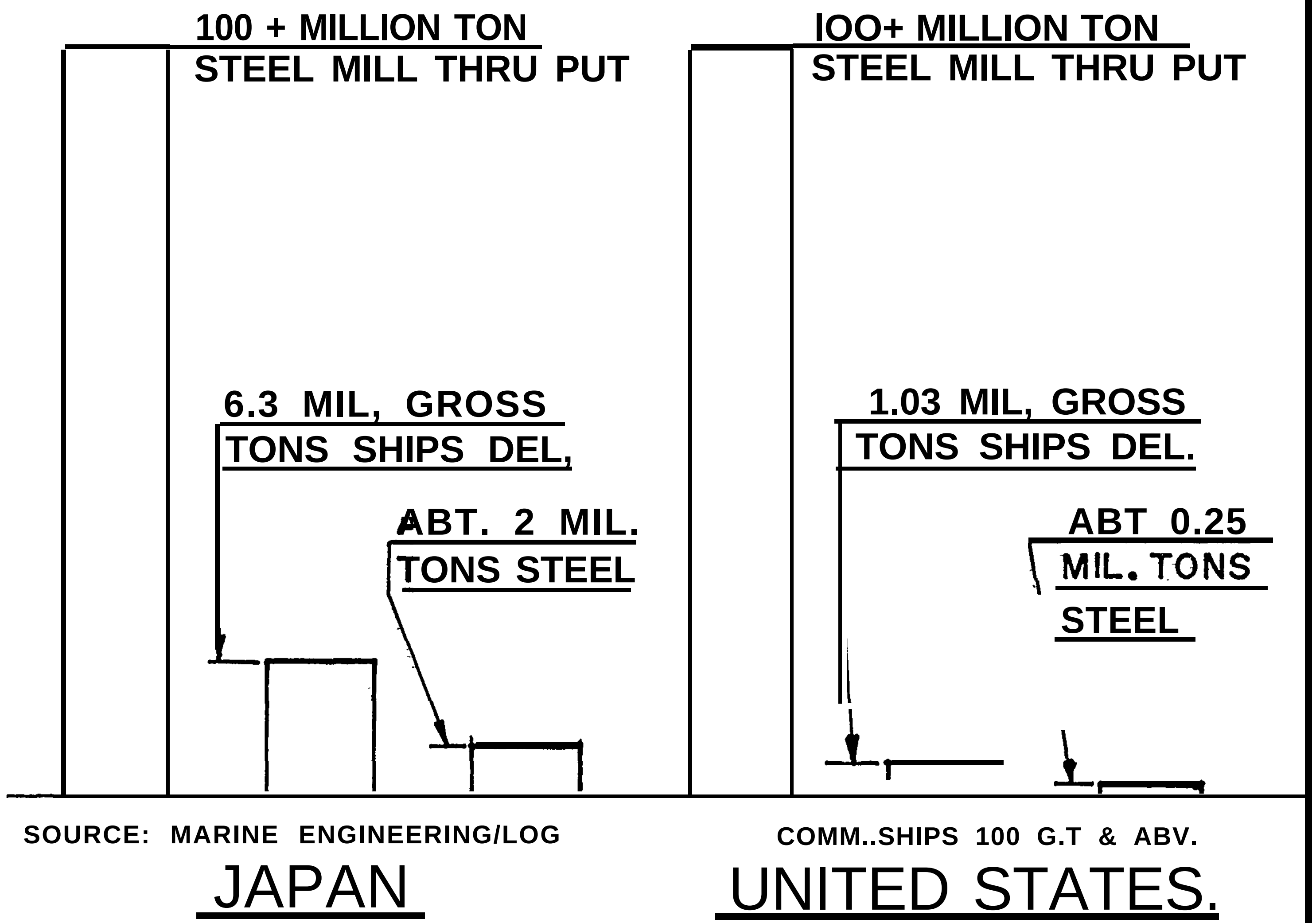
As to the cost of shipbuilding, U.S. versus Japan, in the recent article in the magazine, "The American 'Shipper", June issue, by Tim Colton, it pointed out the differences in time and cost in construction of identical ships. The 32,000 DWT bulk carriers of the I.H.I. "FUTURE 32" design. It was shown that Japan in the I.H.I. Aioi Shipyard could build the ship in 12-months at a cost of $20-million, while the same ship will take 26-months and $40-million to build in the U.S., Levingston Shipyard. This can't all be attributed to the differences in shipbuilding steel philosophies as it is a much more complicated study.

Also, when speaking of shipbuilding cost the subject of subsidies and cheap labor often arise when comparing U.S. and Japanese shipbuilding. While the Japanese often build ships for the export market foregoing their profit (which is made up in their domestic market) they do not directly subsidize their shipbuilding industry but offer an indirect subsidy in the form of investment tax credits and such just as with most of the world shipbuilding industry. Only the U.S. has a direct method under the Merchant Marine Act of 1970 for a construction differential subsidy (CDS). Also, Japanese workers are as well paid and provided for as their U.S. counterpart. The amazing thing is the productivity ratios of the two nations which is where most of the Japanese success is to be had. The U.S., in the first quarter of 1979, registered 60.3-million metric tons of steel shipped. (Example #6). The shipbuilding industry had orders placed for about 4-million deadweight tons of vessels which is about 1-million tons of steel. This is not enough to make the steel industry leap with joy as they are only running at about a 75-percent capacity. This will further erode our possibilities of getting the specialized shipbuilding structural steels so often needed in our industry.

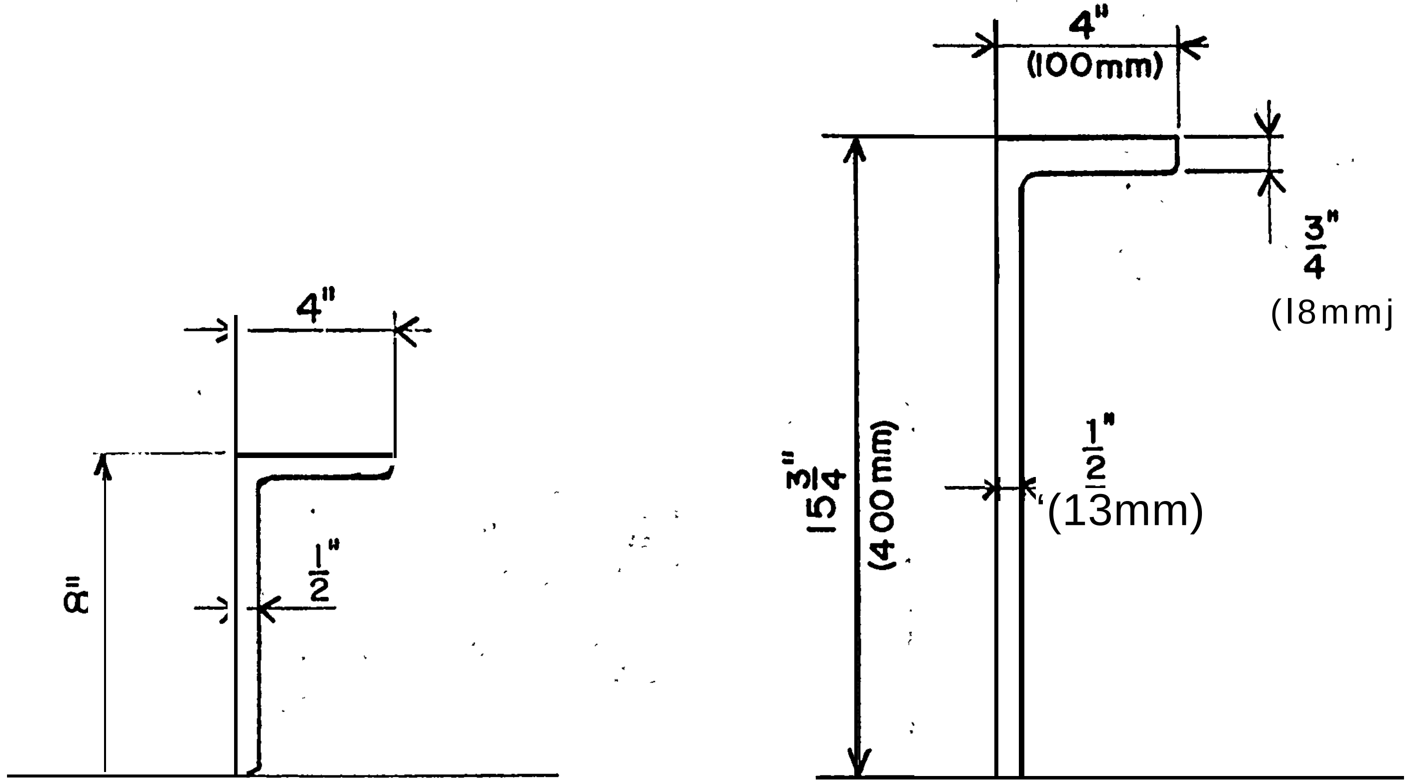
CONCLUSION:

The shipbuilding industry in the United States needs the specialized shipbuilding steel structurals and shapes in order to turn the tide to become once again "Master" of the seas. I heard the unsubstantiated rumor that during a recent military maneuver to overseas ports some of the U.S. military equipment had to be shipped on foreign ships due to the U.S. having too few of the ship types necessary to do the job. Also, according to the July "Boilermakers Blacksmiths" reporter, Harold J. Buoy, Metal Trades Council International President said, "We must make the United States the number one shipbuilding nation in the world." "We have a common goal -- what shipyard worker's need, America needs." It is a matter of economics as to why the U.S. steel mills do not produce proper structural shapes as do the Japanese steel mills. But, when the needs of our nation are so critical for strong maritime and naval fleets, we will need and hopefully have, much to the delight of the steel and shipbuilding industry, the raw-materials to do the job, which is to "PUT THE U.S. BACK IN THE NUMBER ONE POSITION IN THE WORLD".

FIG. NO. 1



STEEL VS. SHIPS DELIVERED IN I978



U. S. STRUCTURAL

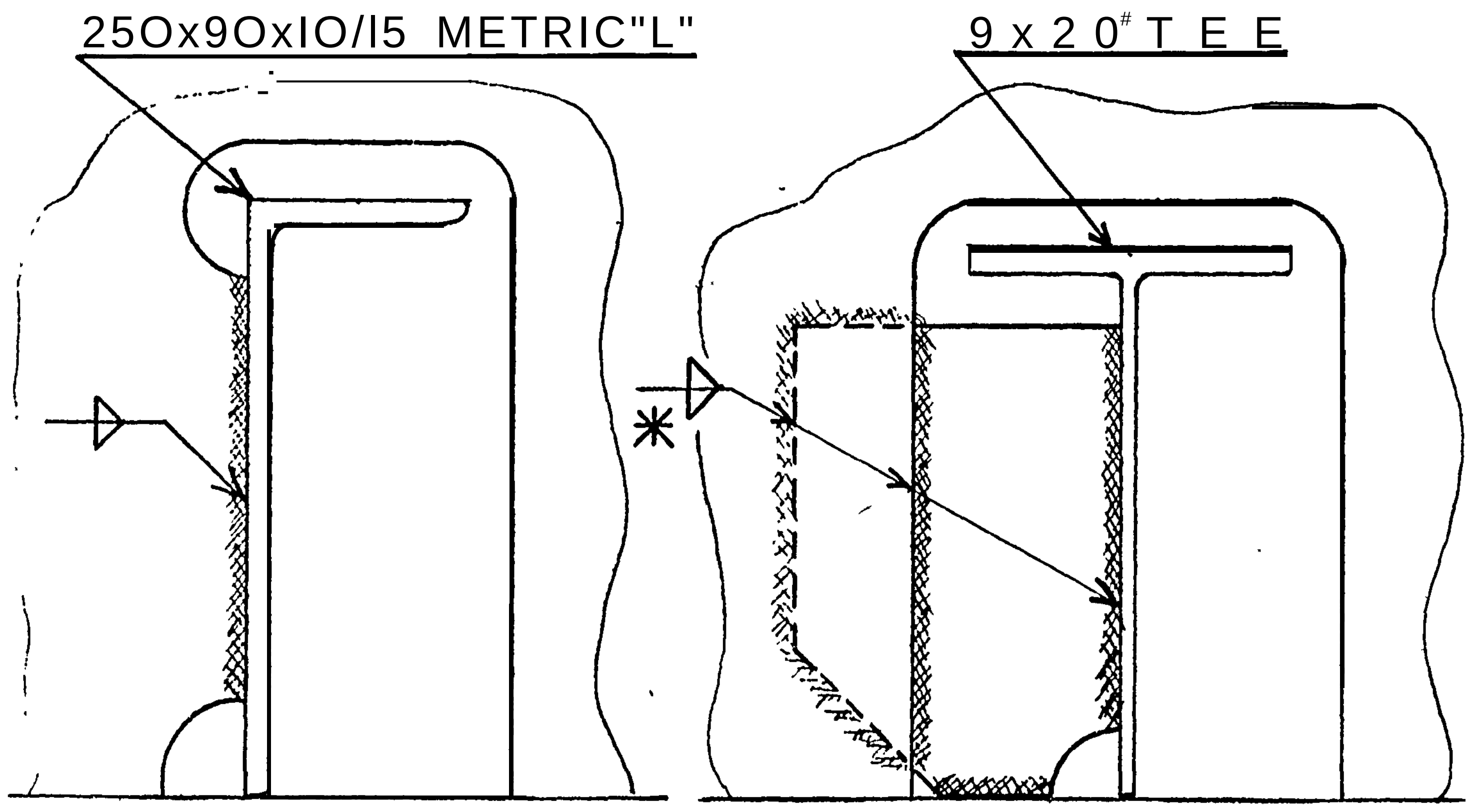
TO 9x4x I

JAPANESE

FROM 200x90mm(8"X3.5")

TO 400 mm x IOOmm (153/4"X4")

FIG. NO. 2

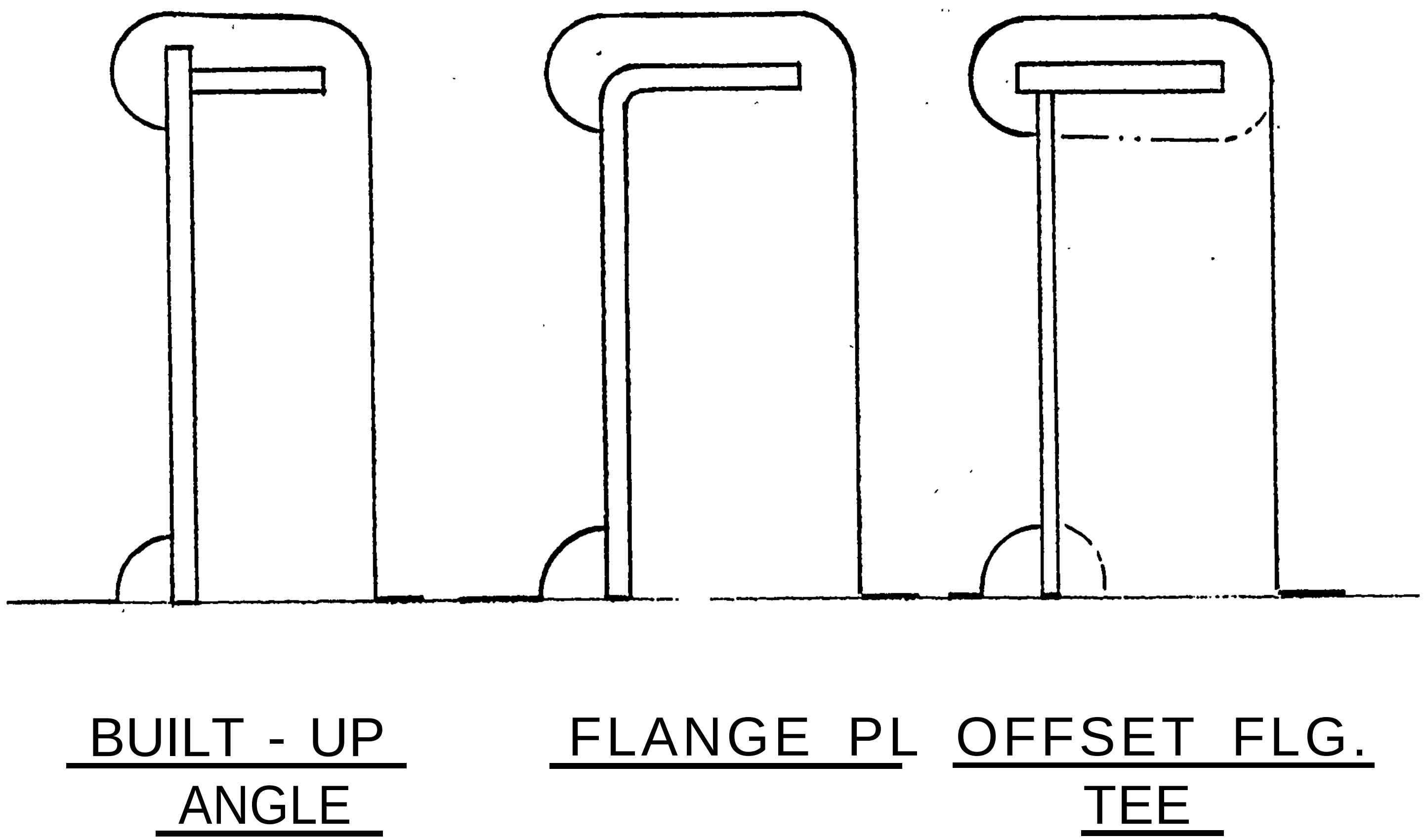


USED AT IHI AI01 SHIPYARD

SUBSTITUTION AT LEVING STON

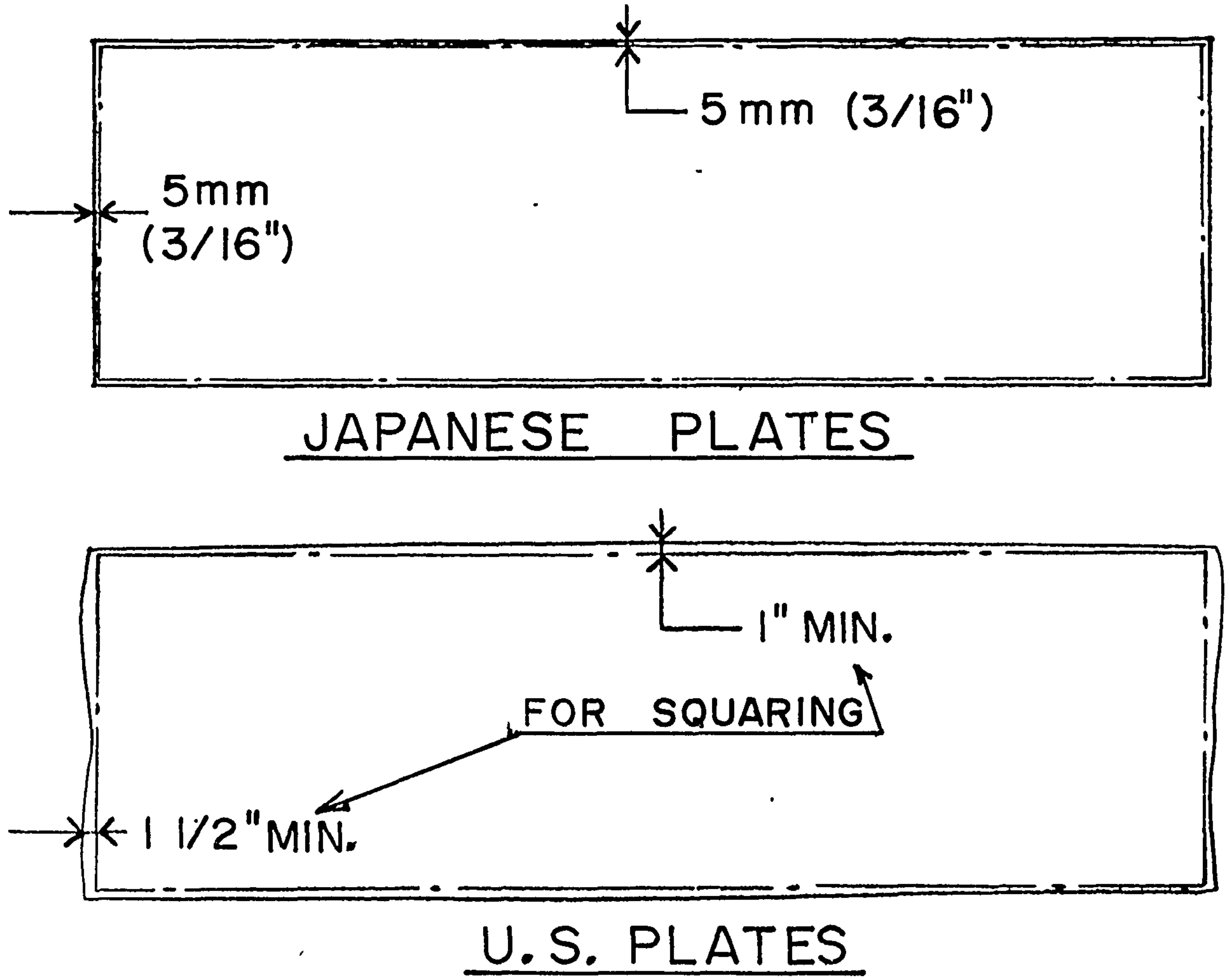
* 3500'-0" ADDITIONAL WELDS IN MIDBODY BOTTOM a STRUCTURE

FIG. NO. 3



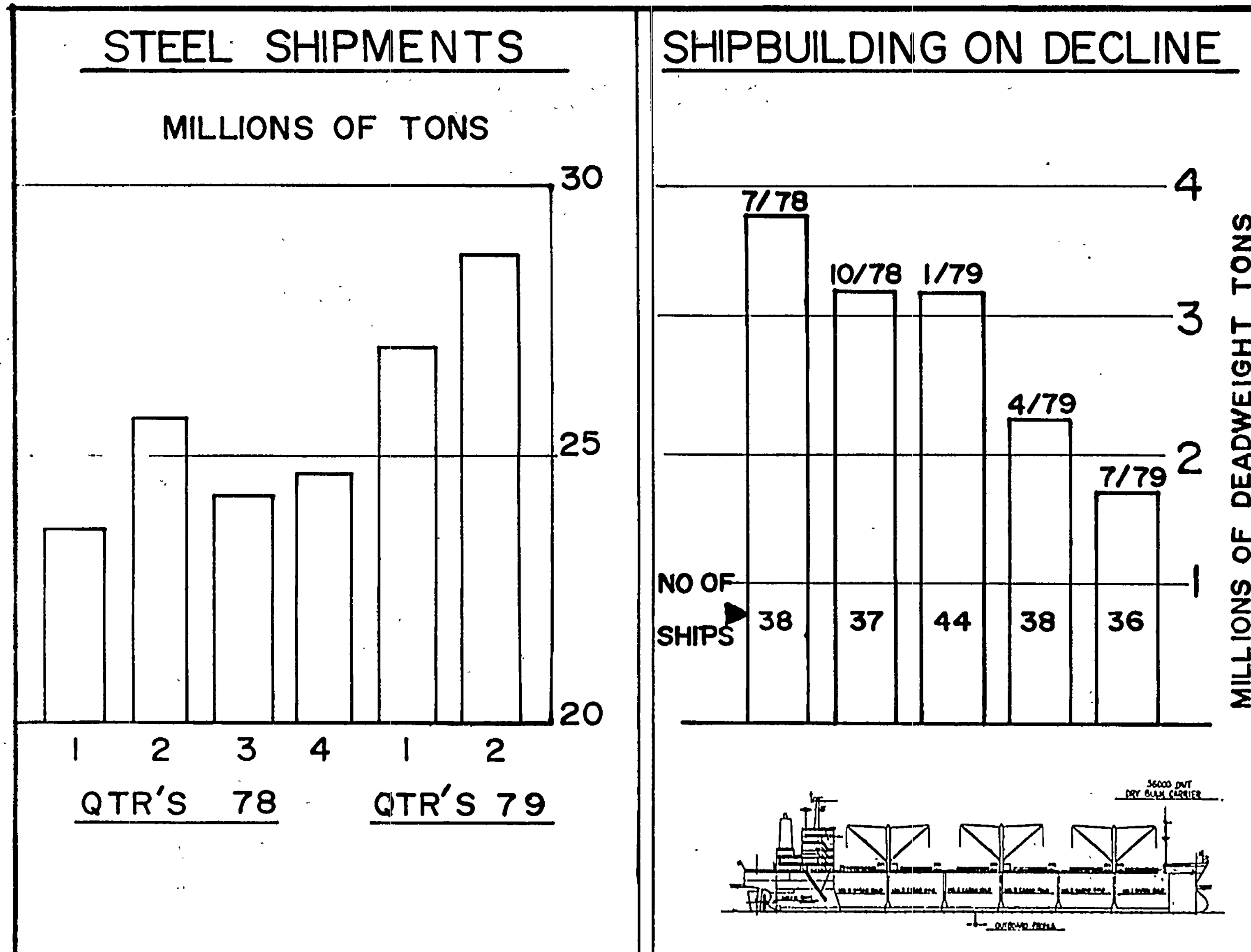
ALL REQ. ADD. MANHOURS TO FABRICATE

FIGURE NO.4



COMPARISON OF PLATES AS SHIPPED

FIG. NO. 5



SOURCE : AISI AND IRON AGE AUG. 6, 1979 FIG. NO. 6

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